Advancing Resource Management in Nebraska

A Demonstration project Sponsored by the Nebraska Environmental Trust

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In Partnership with:

The Nebraska State Recycling Association
City of Omaha Public Works Department
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EXECUTIVE SUMMARY

Between 1993 and 1998 the Nebraska Environmental Trust and the Department of Environmental Quality awarded more than $12 million in grants for recycling collection, processing, market development, and end-use projects throughout the state. While this focus on developing Nebraska's recycling infrastructure has proven highly effective in increasing overall state recycling rates, in recent years recycling rates have leveled off, suggesting the need for a new approach to continue progress toward reducing the State's waste stream.

Most of Nebraska's waste stream is addressed through solid waste contracts that provide no incentives for waste and cost reduction. Traditionally, waste disposal volumes or service levels have driven compensation for solid waste service contracts. In such arrangements, the financial incentives of the waste generator and the solid waste contractor are at odds; while the waste generator has an incentive to decrease waste quantities, the contractor is better off handling continuously increasing quantities of waste. These conflicting objectives work to impede serious progress in waste reduction.

Resource Management (RM) is a strategic alternative to disposal contracting that emphasizes cost-effective resource efficiency through prevention, recycling, and recovery while limiting hauling and disposal. RM is premised on the idea that contractors will pursue resource efficiency when provided the correct financial incentives. RM contracts align waste generator and contractor incentives by constraining disposal compensation and providing opportunities for both the contractor and the generator to profit from resource efficiency innovations (Table ES-1). Thus, if a contractor identifies cost-effective recycling markets for disposed materials, or techniques for preventing waste altogether, they receive a portion of the savings resulting from the innovation. This arrangement enhances recovery of readily recyclable materials such as corrugated cardboard and wood pallets, while also encouraging source reduction and market development for difficult to recover materials such as paint sludge and solvents. Ultimately, this compensation scheme harmonizes the incentives of both parties: waste generators and their contractors benefit from resource efficiency innovations.

Using contractual relationships to reduce, not just handle, waste is a novel idea that is attracting increasing attention in both industry and government. The General Motors Corporation (GM) coined the term "resource management" in the late nineties to "provide a systems approach to resource efficiency that motivates cost reduction and conservation of plant resources." [1] One year after implementing RM contracts at several of its North American Plants, GM realized a 20 percent reduction in overall waste generation (30,000 tons), a 65 percent increase in recycling (from 50,000 tons to over 82,000 tons), and a 15-30 percent decrease in waste management costs.

Table ES-1: Features of Traditional Waste Service versus RM Contracts

Features	Traditional Waste Service Contracts	RM Contracts
Contractor Compensation	Unit price based on waste volume or number of pick-ups.	Capped fee for waste/hauling disposal service. Performance bonuses (or liquidated damages) based on value of resource efficiency savings.
Incentive Structure	Contractor has a profit incentive to maximize waste service and volume.	Contractor seeks profitable resource efficiency innovation.
Waste Generator-Contractor Relationship	Minimal generator-contractor interface.	Strategic alliance: waste generator and contractor work together to derive value from resource efficiency.
Scope of Service	Container rental and maintenance, hauling, and disposal or processing. Contractor responsibilities begin at the dumpster and end at landfill or processing site.	Services addressed in hauling and disposal contracts plus services that inform and influence waste generation (i.e., product/process design, material purchase, internal storage, material use, material handling, reporting).

This project sought to extend and formalize GM's RM contracting experience to Nebraska by evaluating the potential for RM in four diverse Nebraska case study organizations that rely on traditional waste management contracts: the City of Omaha's Public Works Department, ConAgra, Inc., Metro Community College, and Omaha Public Power District. While each organization shares the common practice of contracting for solid waste and recycling services, the way in which contracts are executed and service is delivered varies dramatically from one organization to the next, which in turn influenced the development and application of standard RM contracting practices:

- The City of Omaha Public Works Department (OPWD) executes integrated waste management service contracts on behalf of its over 121,000 residential households in Omaha.

- ConAgra's contracts for its corporate campus, which encompasses 5 buildings in downtown Omaha are administered and executed by a third party property management company which is responsible for a wide range of facilities and grounds services on the ConAgra Campus.

- Metropolitan community college executes contracts for disposal and recycling services for four separate campuses located in the greater Omaha metropolitan area.

- Omaha Public Power District's Material Management Division executes solid waste and recycling contracts for 23 separate power generating, maintenance, and customer and administrative support offices throughout a 5,000 square mile region of Eastern Nebraska.

Despite major differences in contract and service delivery across the case study organizations, this project sought to create standard RM contracting practices that could be adopted a wide range of organizations that rely on solid waste contracts and services. Environmental accounting techniques were used to baseline existing waste management services and costs in each case study organization (Table ES-2), and to identify opportunities for RM contracting in each case study organization.

Table ES-2: Baseline Information, 1999

	Omaha Public Works	Metro Community College	ConAgra	Omaha Public Power
Annual Generation (Tons)	143,855	1,511	2,424	6,248
Annual Recycling (Tons)	20,000	31	137	229
Percent Recycled	14%	2%	6%	4%
Service Cost or Affected Contract Value	$2,448,803	$28,550	$57,178	$154,722

Based on techniques used and lessons learned from the case study organizations, standard RM practices were identified that other Nebraska organizations can use to execute RM contracts. These stem from findings regarding: (a) the availability and use of case study organizations' information on current contract pricing structure, payments, and baseline waste management/recycling levels; (b) pre-bid information-gathering tactics, and (c) the nature of the incentives created by current contract pricing structures. These practices, summarized in Table ES-3, are essential elements of any RM contract because they align customer-supplier incentives for resource efficiency by establishing a compensation mechanism based on supplier performance and continuous improvement. Furthermore, the practices provide an information-rich environment in which to evaluate resource efficiency opportunities.

Table ES-3: Summary of Standard RM Practices

RM PRACTICE	DESCRIPTION/EXAMPLES
1. Establish Baseline Cost, Performance and Service Levels	♦ Define scope and service levels ♦ Identify existing contract and compensation methods ♦ Establish cost and performance benchmarks ♦ Establish goals
2. Seek Strategic Input from Contractors	♦ Convene pre-bid meetings with contractors to articulate goals and address questions ♦ Allow or require bidders to submit operations plans for achieving specified improvements in existing operations
3. Align Waste and Resource Efficiency Services	♦ Coordinate, integrate, and formalize all contracts and services included in the baseline scope identified in Practice 1 ♦ Ensure that contractor has access to "internal" stakeholders that influence waste management and generation
4. Establish Transparent Pricing for Services	♦ Delineate pricing information to specific services such as container maintenance, container rental, hauling, disposal, etc. ♦ Allow variable price savings, such as "avoided hauling and disposal" to flow back to generator and/or be used as means for financing performance bonuses.
5. Cap Compensation for Garbage Service	♦ Establish a cap on waste hauling/disposal service compensation that decreases gradually over time ♦ De-couple contractor profitability from waste generation and/or service levels. ♦ Based initially on reasonable estimates of current hauling and disposal service and costs as per practice 1.
6. Provide Direct Financial Incentives for Resource Efficiency	♦ Establish compensation that allows contractor to realize financial benefits for service improvements and innovations. ♦ Assess liquidated damages for failing to achieve minimum performance benchmarks or standards.

Based on the practices identified in ES-3, an assessment was conducted to determine the extent to which Nebraska case study organizations had adopted such practices (Table ES-4). Lack of comprehensive RM practices in case studies is attributed in part to the fact that hauling and disposal costs are small compared to other organizational costs. Metro, ConAgra, and OPPD, for example, expend under .05% of annual operating expenditures on garbage and recycling contracts. As a result, these organizations logically focus resources on larger operating costs, and develop competencies in areas fundamental to their core business activity. Interestingly, OPWD, which spends substantially more on hauling, recycling, and disposal contracts in both absolute terms and as a percentage of total organizational expenditures, had adopted more RM practices at the outset of this project than the other case study organizations.

Table ES-4: Baseline RM Practices in Case Study Organizations, 1999

RM Practices	Omaha Public Works Department	Metro Community College	ConAgra	Omaha Public Power District (1)
Establish Baseline Cost, Performance and Service Levels	✔	✔	✔	✔
Seek Strategic Input from Contractors				
Align Waste and Recycling Services	✔			✔
Establish Transparent Pricing for Services	✔			
Cap Compensation for Garbage Service	✔			✔
Provide direct Financial Incentives for Resource Efficiency				

Notes:
1) Results for OPPD apply to the Energy Plaza Facility.

To estimate how enhanced RM contracting would affect waste diversion rates (i.e., reduction, reuse recycling, composting) and contract costs within each organization, specific cost-effective and technically feasible diversion practices were identified for each organization. Only those diversion practices that were less expensive than baseline hauling and disposal practices were deemed "cost-effective." We assumed that an RM contractor that receives payment based in part on identification of cost-effective diversion strategies would implement such strategies and capture a portion (but not all) of the cost-effective tonnage. Additionally, we focused only on recycling enhancements that built on existing recycling efforts within each organization. Thus, source reduction, composting, and other market development innovations which often result in more advanced forms of RM contracting and service were not examined in detail.

The results, summarized in Table ES-5, suggest that adoption of RM contracting practices would produce increases in recycling ranging from 50% to over 1400% in case study organizations at savings of between 7% and 68% of current contract values. These savings could in turn be used in whole or in part to finance RM contractor performance bonuses without increasing the overall cost of organization's baseline solid waste contracts. Therefore, while savings on hauling and disposal may be relatively insignificant for a waste generator relative to other expenses, they represent potentially large increases in contract value for an RM contractor.

Table ES-5: RM Potential in Case Study Organizations, 1999

Estimated Impact	Omaha Public Works	Metro Community College	ConAgra	Omaha Public Power
Additional Tons Recycled-"Cost Effective Tonnage"	10,000	442	572	NA
Percent Recycled	21%	31%	29%	Unknown
Percent Increase in Recycling	50%	1426%	418%	NA
Percent Decrease in Disposal	11%	30%	25%	NA
Savings—"Gain Sharing Potential"	$180,351	$19,466	$15,134	NA
Savings as a Percent of Affected Base Service Cost	7%	68%	26%	NA

RM holds the promise of transforming the waste management industry by changing how waste-related companies define the value of their services and the way they generate profit. However, supplying RM services is by no means an opportunity limited to traditional waste management companies. Because RM requires a broader array of information-intensive management services, there are several other classes of companies potentially capable of providing RM services filling the role, including engineering firms, management consultants, or property management groups. Initial indications suggest that RM can be highly profitable for suppliers, whatever their current make-up or designation. In a Resource Management Supplier Forum convened as part of this project in Omaha on October 13, 2000, over 30 potential RM "suppliers" provided feedback on challenges and opportunities associated with providing RM service and, significantly, expressed interest in providing RM service to their customer base.

Likewise from a customer perspective, organizations are beginning to recognize that RM contracting is fairly easy to implement and results in a multitude of short and long term benefits, such as reduced administrative, material handling, processing and disposal costs; more focused and coordinated resource efficiency; reduced liability; and improved tracking and information systems. The real selling point with RM may be its potential to produce resource efficiency improvements and added value without increasing net contract costs to the customer. Despite these potential benefits, RM is not yet widespread. In addition to the issue of low cost visibility to potential RM customers, there is a lack of general information on the RM model itself and how it may apply in different organizational contexts. Broader dissemination of the RM concept, and practical information detailing its application will be required to advance the RM agenda.

Between 1992 and 1998, the value of recycled commodities and avoided disposal costs resulting from recycling in Nebraska was nearly $75 million. The uncaptured value of recyclable commodities that remain in Nebraska's waste stream, and the potential to significantly increase and allocate avoided disposal fees through RM practices could be a boon to both generators and

and RM service providers in Nebraska. As noted previously, the state has made significant progress developing a recycling infrastructure for collection, processing, and end-use of recycled materials but recycled quantities have leveled off in recent years. By transforming relationships between waste management companies and their customers, RM will help Nebraska achieve the "next level" of waste reduction.

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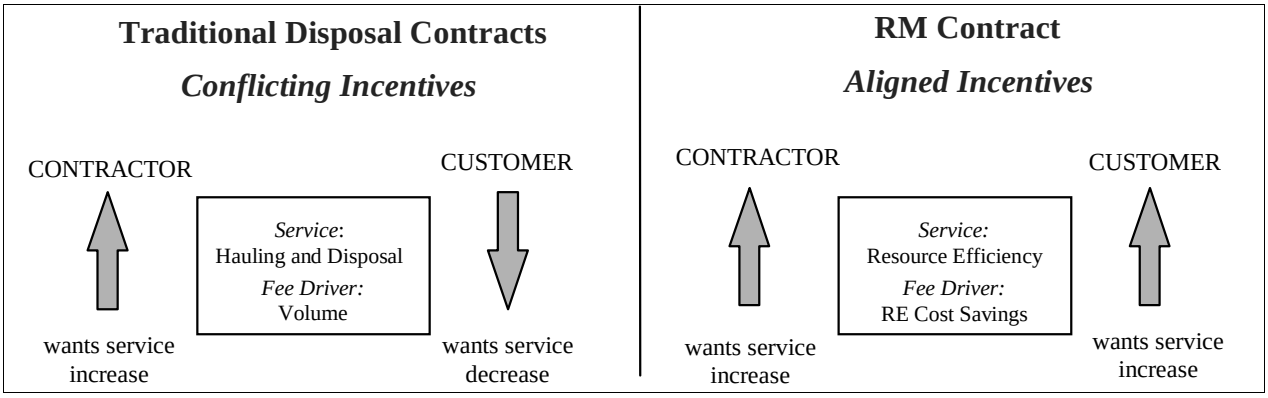
1. INTRODUCTION

"THERE ARE NO WASTE STREAMS, ONLY WASTED RESOURCES"

Raj Mishra, Program Manager
General Motors Corporation, 1999

Resource Management (RM) is a strategic alternative to disposal contracting that emphasizes cost-effective resource efficiency through prevention, recycling, and recovery while limiting hauling and disposal. RM is premised on the idea that contractors will pursue resource efficiency when provided the proper financial incentives. RM contracts align waste generator and contractor incentives by constraining disposal compensation and providing opportunities for both the contractor and the generator to profit from resource efficiency innovations. Thus, if a contractor identifies cost-effective recycling markets for disposed materials, or techniques for preventing waste altogether, they receive a portion of the savings resulting from the innovation. This arrangement enhances recovery of readily recyclable materials such as corrugated cardboard and wood pallets, while also encouraging source reduction and market development for difficult to recover materials such as paint sludge and solvents. Ultimately, this compensation scheme harmonizes the incentives of both parties: waste generators and their contractors benefit from resource efficiency innovations (Figure 1).

Figure 1: Contractor and Customer Incentives in Traditional Disposal and RM Contracts



The General Motors Corporation (GM) coined the term "resource management" as a logical outgrowth to its success with a similar performance-based contracting system in the area of chemical purchasing, use, and management.[2] GM adopted RM in response to an internal corporate waste reduction goal and the recognition that existing hauling and disposal contracts produced limited and uncoordinated resource efficiency across its more than 70 North American facilities. GM's objective in executing RM contracts was to "provide a systems approach to resource efficiency that motivates cost reduction and conservation of plant resources."[3] One year

after implementing RM contracts at several of its North American Plants, GM realized a 20 percent reduction in overall waste generation (30,000 tons), a 65 percent increase in recycling (from 50,000 tons to over 82,000 tons), and a 15-30 percent decrease in waste management costs.

RM contracts de-couple disposal quantity and/or service levels from contractor's profit incentive. For example, contracts may establish a cap for waste management service costs based on current costs and then include a profit-sharing arrangement for cost effective resource efficiency innovations that are identified by the contractor. When compensation is changed in this way, many basic features of hauling and disposal contracts also change as shown in Table 1.

Table 1: Distinguishing Features of Waste Hauling/Disposal versus RM Contracts

Features	Traditional Hauling and Disposal Contracts	RM Contracts
Contractor Compensation	Unit price based on waste volume or number of pick-ups.	Capped fee for waste/hauling disposal service. Performance bonuses (or liquidated damages) based on value of resource efficiency savings.
Incentive Structure	Contractor has a profit incentive to maximize waste service and volume.	Contractor seeks profitable resource efficiency innovation.
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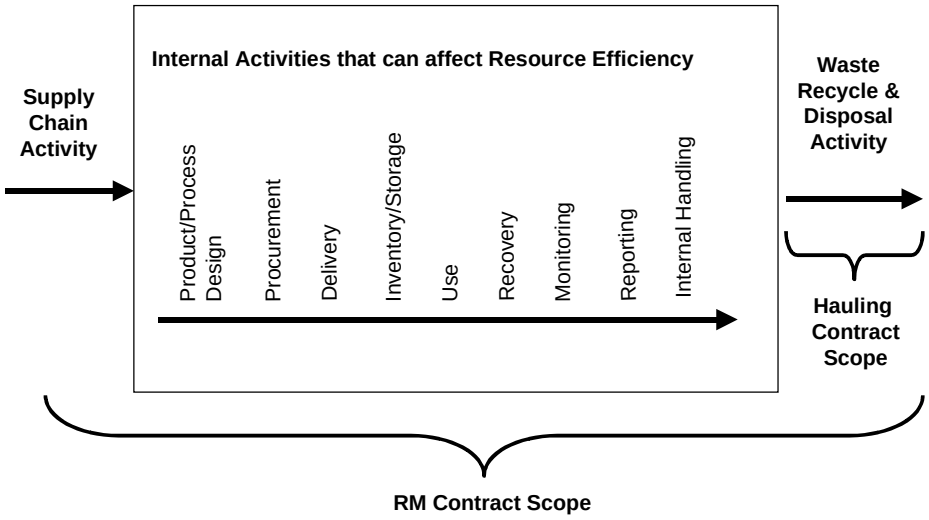
RM changes the way in which waste generators and their contractors interact because the RM contractor must interface with a broader range of stakeholders that are capable of influencing waste generation, such as custodial staff, environmental engineers, purchasers, process and design engineers, and other contractors. Thus, the relationship between the generator and the RM contractor is more like a strategic alliance in which the generator relies on the core competence of the RM contractor to identify and implement resource efficiency innovations.

As opposed to the exclusively external focus of traditional waste management contracts, an RM contractor may address both external waste management activities and internal activities that affect waste generation (Figure 2). Initially, the scope of an RM contract might focus on optimizing external handling, monitoring/reporting, or recovery services (i.e., the "waste recycle

and disposal activities" shown at the far right of Figure 2). However, the longer RM contracting is in place, the greater the profit incentive for the RM contractor to create resource efficiency strategies that will influence internal activities. Thus, in more advanced forms, RM can lead to more efficient material use, storage, and ordering; reduced purchase costs; or ultimately more resource-efficient product or process design.

Figure 2: RM versus Hauling Contract Scope in a Typical Industrial Setting



Although the internal activities depicted in Figure 2 vary from organization to organization, a similarly comprehensive RM scope applies in non-industrial settings as well. For example, in public institutions and/or small businesses, RM contractors might work closely with internal janitorial and administrative staff to optimize resource efficiency. In municipal residential settings, an RM contractor might assume a more active role in public education and outreach to foster increased participation in recycling. Regardless of the organization type or source of resource efficiency, savings are shared between the generator and RM contractor.

The remainder of this report builds on GM's early efforts with RM by evaluating RM potential and practices in four diverse Nebraska organizations that currently rely on waste management contracts: ConAgra Incorporated, City of Omaha Public Works Department, Metro Community College, and the Omaha Public Power District. Environmental accounting techniques were used to quantify the costs of current waste management contracts in each organization, and identify opportunities for RM-based contractual arrangements that provide incentives for enhanced waste reduction service at no extra cost to the customer organization. This information is presented in Chapters 2 through 5.

Based on contract information and lessons learned from each case study organization, standard or "model" RM contracting practices are presented and discussed in the context of the case study

organizations in Chapter 6. These practices apply to both case study organizations and other organizations throughout the state that rely on hauling and disposal contracts.

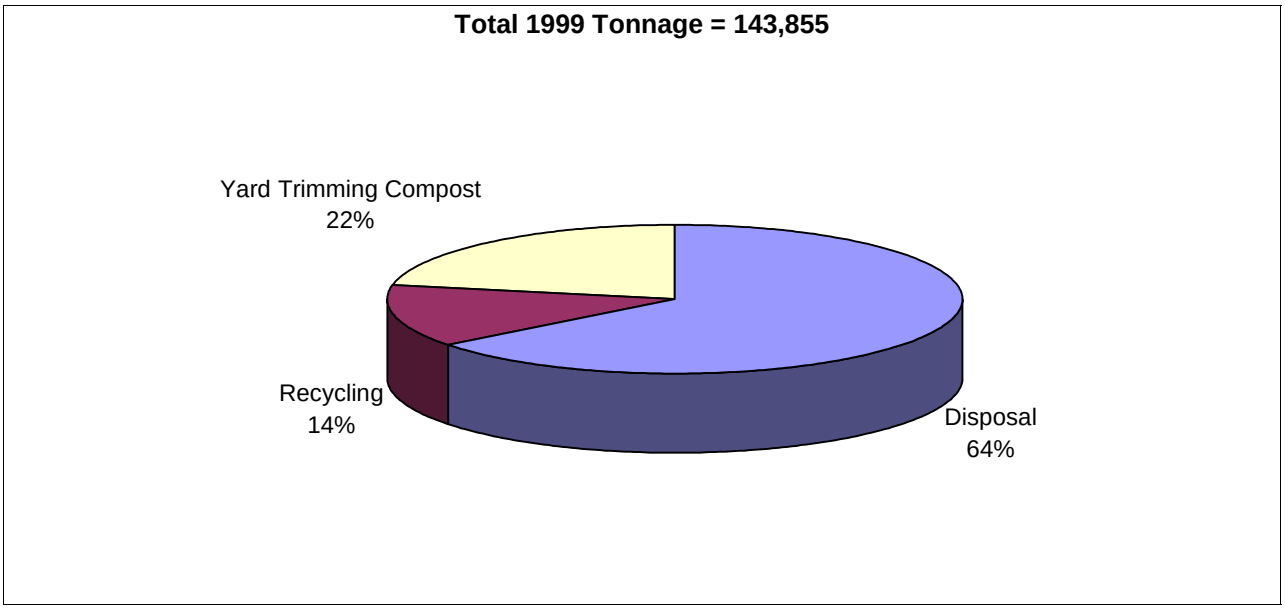
Chapter 7 provides a discussion of RM contractor issues and perspectives based on a Nebraska "RM Supplier Forum" that was convened on October 3, 2000 at the Omaha Public Power District. Finally, Chapter 8 presents general conclusions and lessons learned. In addition to this report, general information on RM and project-specific results was disseminated through three public workshops across Nebraska in late March 2001. [4]

2. CITY OF OMAHA PUBLIC WORKS DEPARTMENT

The City of Omaha Public Works Department (OPWD) is responsible for city engineering, traffic engineering, street construction, maintenance, cleaning, sewers and sewage treatment, garbage collection and disposal, and street lighting. The OPWD contracts for solid waste, recyclables, and yard trimmings collection service provided to over 121,000 residential households in Omaha. In 1999, nearly 144,000 tons of material was managed as shown below. [1]

The OPWD solid waste management situation is unique in two ways. First, its service delivery involves a three party scenario: the waste contractor, the residential customers, and OPWD – the provider. Second, the OPWD already had the precursors of an RM contract in place. The challenge in this case was to explore how existing general incentives could be more effectively structured and formalized through RM contracting.

Figure 3: OPWD Integrated Waste Management Tonnage Breakdown, 1999



The City's curbside recycling program dates back to the early seventies. The current program, implemented in 1995, provides weekly collection of newsprint, HDPE and PET plastic, aluminum cans, steel cans, glass bottles, corrugated cardboard, mixed paper, and newsprint. Participating residents place newsprint and mixed paper in separate sacks, and mixed containers in a green bin. All recyclables are placed at the curb and sorted into a seven-compartment recycling vehicle by the OPWD's recycling collection contractor. Collected materials are

[1] In addition to the services described here, the City provides bulk waste collection and various drop-off services to residents.

transported to a private material recovery facility where they are processed and marketed. Anecdotal evidence, suggests that 50% - 60% of eligible city residents participate in the recycling program, and that there is tremendous variation in participation across neighborhoods. Nearly 20,000 tons of recyclables were collected from city residents in 1999.

Weekly collection of yard trimmings is provided to city residents from April 1 through November 31.[2] Residents may place yard trimmings in a well-marked reusable container or a paper bag. The OPWD's yard trimming collection contractor uses a compactor vehicle to transport yard trimmings to a OPWD yard waste composting facility, where material is composted in a spacious windrow composting process and marketed. Approximately 32,000 tons of yard trimmings were collected from city households in 1999.

Residential trash is collected weekly by the OPWD's garbage collection contractor and transported to the privately operated Douglas County Landfill. Nearly 82,000 tons of trash were collected from city residents and disposed in the Douglas County landfill in 1999.

Baseline Contracts, Compensation, and Incentives

The OPWD uses five separate contracts to provide residential recycling, composting, and disposal services.[3] All current contracts extend from 1996 to 2002. Annual expenditures on 1999 contracts were nearly $12 million as shown in the breakdown provided in Figure 4 below. Key information regarding individual contracts includes the following:

1) *Garbage and recycle collection*: weekly curbside collection of trash and recyclables from Omaha's single-family households. The OPWD pays $5.07 per household per month for collection services to 121,006 households. This is by far OPWD's most expensive contract representing about 60% of residential contract costs (over $7 million annually). Note that the contractor is compensated on the basis that all households receive service, although all houses may not choose to use service on any given week. For example, OPWD estimates that only about half of the eligible population sets out recyclable materials on any given week.

2) *Yard waste collection*: weekly curbside collection of yard trimmings from Omaha's single-family households from April 1 through November 30. The OPWD pays $2.39 per household per month for services over an 8 month period (approximately $2.3 million annually). Since yard trimmings are banned from disposal, virtually all residential yard trimmings are collected in this program (except for that which is composted or disposed of on-site by residents).

3) *Recyclables processing:* processing and marketing of recyclable materials collected through the garbage and recycling collection contract (item 1). The OPWD pays no fee for this contract and receives 50% of material revenues after the first 5,000 tons. This arrangement is

[2] The state of Nebraska banned disposal of yard trimmings (leaves, grass, and brush) in landfills in 1993.
[3] As will be discussed, the agreement with Douglas County landfill is not actually a contractual agreement.

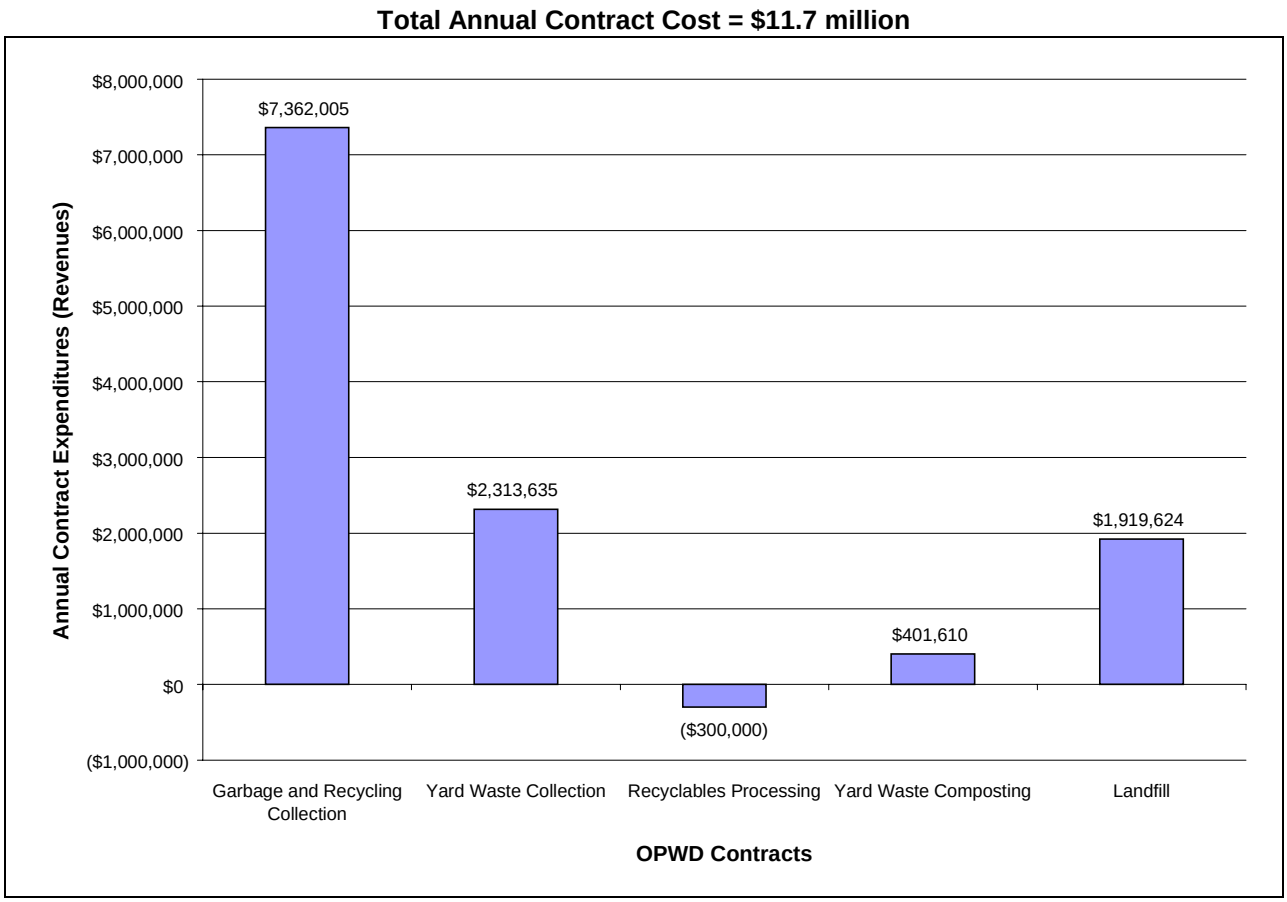
quite attractive because the OPWD receives a significant share of the benefits of strong commodity markets (i.e., approximately $300,000 in 1999), without assuming any of the risks associated with volatile commodity markets. This is a lucrative and unique arrangement for the City that probably resulted from strong recycled paper commodity markets when the contract was executed in 1994.

4) *Yard waste processing* composting and marketing of materials collected through the residential contract (item 2). The OPWD pays $18.04 per ton processed for the first 26,500 tons and $9.93 thereafter and receives all revenues from the sales of finished compost (approximately $120,000 in 1999). A division of the OPWD serves as the contractor for this based on a competitive, open market bid process.

5) *Land disposal:* waste collected from city residents (item 1) is disposed at the Douglas County landfill. The OPWD has no contract or "minimum tonnage agreements" with the landfill and therefore pays spot market prices of $20.75 per ton disposed (approximately $2 million in 1999). The $20.75 includes $6.25 per ton in local and State surcharges. The "no minimum" arrangement is important because it allows the OPWD to realize avoided disposal savings as disposal quantities decline due to waste reduction.

While the contracts described above provide an opportunity for OPWD to realize cost savings in the form of avoided disposal costs and increased recycling revenues, they do not provide incentives for the garbage and recycling contractor to increase diversion/recycling rates. As the next section will discuss, structural adjustments to contracts could provide price signals to contractors (in the form of performance bonuses and liquidated damages) to increase recycling rates without significantly altering overall contract costs.

Figure 4: OPWD Annual Expenditures on Residential Integrated Waste Management Contracts, 1999



Opportunities for Cost Savings and Enhanced Recycling Service

Because the OPWD has separate collection, processing, and disposal contracts, it can use savings from its disposal contract to leverage improvements in recycling collection without increasing overall contract costs (Table 2).

Table 2: Financial Potential of Resource Management for Omaha Public Works Department Services

SERVICE CONTRACTS	FEE UNITS	BASELINE: 1999 DATA			INCREASED RECYCLING		DECREASED RECYCLING	
		Number of Fee Units	Hypothetical Bid/Unit	Hypothetical Annual Bid Price	Number of Fee Units	Hypothetical Annual Bid Price	Number of Fee Units	Hypothetical Annual Bid Price
Garbage Collection (1)	Households	121,006	$41	$4,913,203	121,006	$4,913,203	121,006	$4,913,203
Land Disposal	Tons	92,512	$21	$1,919,624	82,512	$1,712,124	102,512	$2,127,124
Recyclables Collection (2)	Households	121,006	$20	$2,448,803	121,006	$2,448,803	121,006	$2,448,803
	Tons over '99	0	$18	$0	10,000	$180,351	0	0
	Tons under '99	0	-$36	$0	0	$0	10000	($360,702)
Recyclables Processing (3)	Tons	19,582	-$15	($300,000)	29,582	($453,202)	9,582	($146,798)
Yard Waste Collection (4)	Households	121,006	$19	$2,313,635	121,006	$2,313,635	121,006	$2,313,635
Yard Waste Processing (5)	Tons	25,500	$18	$459,000	25,500	$459,000	25,500	$459,000
	> 25,500 tons	6,261	$10	$62,610	6,261	$62,610	6,261	$62,610
	Tons sold	NA	NA	($120,000)	NA	($120,000)	NA	($120,000)
TOTALS				**$11,696,874**		**$11,516,523**		**$11,696,874**

Notes:

NA Not available

Bids per unit have been rounded and may not exactly match annual bid prices.

(1) Unit cost of garbage collection is estimated at 67% of combined garbage/recycling contract bid price of $5.07 (in 1999 dollars) based on the relative cost of co-collection of recyclables in the same vehicle ($3.15/house/month), versus sorted collection in separate vehicles ($4.73/house/month) in the 1995-96 bid.

(2) Annual unit cost is the difference between 1995-96 bid price for Garbage and recycling collection ($4.73/house/month) and bid assumed 1995-96 bid price for one vehicle collection ($3.15; see note 1 above). Values are inflated to 1999 dollars based on 1999 bid price.

(3) Assumes total recycling revenue paid to city is $300,000 annually based on 1999 payments.

(4) Annual unit cost assumes the city pays $2.39 per household per month over an 8-month period.

(5) Annual unit cost assumes city pays $18.04 per ton processed for the first 26,500 tons and $9.93 thereafter and receives all revenues from the sales of finished compost (approximately $120,000 in 1999).

The first two columns in Table 2 show OPWD's contracted services, along with "fee units" upon which contractors currently receive compensation for service. Currently, fee units for collection services are the total number of households eligible to receive service, while fee units for processing and disposal service are based on the tonnage of materials processed or disposed. In addition to current fee units, two new *performance-based* fee units are added to recyclables collection: "Tons over 99" and "Tons under 99."

The performance based fee units provide a financial incentive for collecting more recyclables, and a disincentive for collecting less. The fee unit for "Tons over 99" is $18, which simply means that for each recyclable ton over 1999 levels collected, the contractor would receive a $18 bonus. This is calculated assuming that the contractor receives one half of city savings on avoided disposal costs and increased revenue for recyclable commodities. The fee unit for "Tons under 99" is shown as negative $36, which means that if less than 1999 levels of recyclables are

collected, the contractor pays OPWD the equivalent of $36 per ton to cover costs associated with land disposal ($20.75 per ton) and lost recyclables processing revenue (about $15 per ton).

Baseline 1999 data reflect OPWD's current contracting arrangements and costs. This is followed by two examples that show how OPWD's contract costs would change with increased and decreased recycling levels with use of the performance based fee units in the recyclables collection contract. In the "Increased Recycling" scenario, the contractor collects 10,000 tons over 1999 levels and receives a total performance bonus of $180,351 which is financed by a combination of avoided land disposal costs and increased recyclable processing revenue. The net result is a slight decline in OPWD's total contracting costs and an increase in recycling collection contractor revenues. While an increase of 10,000 tons over 1999 levels may seem ambitious, anecdotal evidence suggests that only about half of the available recyclables are currently collected due to varying levels of residential participation in the recycling program. A financial incentive may, for example, cause the contractor to seek out strategies to improve participation in areas of the city with lower participation.

In the "Decreased Recycling" scenario, the contractor collects 10,000 fewer tons than in the baseline (1999) scenario and therefore is obliged to pay OPWD liquidated damages in the amount of $360,702 to offset increased costs associated with land disposal and lost recyclables processing revenue. The net effect is no change in OPWD's total contracting cost compared to the baseline.

In this way, establishing performance-based fee units to reward the contractor creates a substantial incentive and disincentive structure for the supplier to work with the customer and its clients to increase diversion and raise recycling rates. The changes can be made without significantly affecting contract costs; in fact, under the increased recycling scenario, net costs actually decrease.

3. METROPOLITAN COMMUNITY COLLEGE

The Metropolitan Community College (Metro) is located in Omaha, Nebraska and provides occupational, academic transfer, and continuing education programs at three main campuses: Elkhorn Valley, Fort Omaha and South Omaha. In addition, Metro has three off-campus learning centers: Sarpy Center, Fremont Center, and Offutt Air Force Base. All five sites are relatively small and geographically disperse. Approximately 12,000 students attend Metro per year, and the majority (approximately 70%) attend school part-time.

Metro contracts for garbage pick-up, disposal, and mixed paper recycling services at four campuses located throughout the metropolitan Omaha area: Fort Omaha, Sarpy Center, South Omaha, and Elkhorn Valley. The Fremont Center and the Air Force Base are not included in the current scope of Metro's garbage disposal contracts. As shown in Table 3, larger campuses, such as Fort Omaha, receive multiple-location garbage container services, and three of the four campuses receive limited, monthly paper recycling service. Recycled paper is collected primarily from administrative offices, classrooms, and computer labs by Metro custodial staff, who transport the material from buildings located across campus to a 6-8 cubic yard recycling containers provided by a local recycling company.

Table 3: Metro Community College Garbage and Recycling Service Description, 1999

Campus Container Locations	Garbage Service Description					Recycle Service Description				
	Number of Containers	Container Size (Yards)	Pick-ups/ Week	Annual Yardage Capacity	Annual Tonnage (1)	Number of Containers	Container Size (Yards)	Pick-ups/ Week	Annual Yardage Capacity (2)	Annual Tons (3)
Ft Omaha	1	8	1	416	52	1	8	0.25	104	19
Ft Omaha	1	6	1	312	39	-	-	-	-	-
Ft Omaha	2	8	4	3,328	416	-	-	-	-	-
Ft Omaha	2	6	1	624	78	-	-	-	-	-
Ft Omaha	2	6	2	1,248	156	-	-	-	-	-
Ft Omaha	1	20	1	800	100	-	-	-	-	-
Ft Omaha	1	12	0	120	15	-	-	-	-	-
Sarpy Center	1	4	1	208	26	-	-	-	-	-
South Omaha	1	8	5	2,080	260	1	6	0.25	78	9
South Omaha	1	8	2	832	104	-	-	-	-	-
Elkhorn Valley	2	6	3	1,872	234	1	6	0.25	78	3
TOTAL	15	92	21	11,840	1,480	3	20	0.75	260	31

Notes:

(1) Estimated assuming full containers and density of 250 pounds per cubic yard.
(2) Yardage estimated assuming full containers
(3) Tonnage based on invoiced amounts.

It is estimated that nearly 1,500 tons of garbage are disposed of annually from the four campuses, and approximately 31 tons of paper, comprising magazines, colored paper, and white office paper, are recycled. Of the four main campuses, Fort Omaha accounts for an estimated 58% of garbage generation (tons), and 61% of recycling (tons).

Although direct observations suggest that as much as half of Metro's garbage consists of recyclable materials, only approximately 2% of Metro's waste stream is being diverted. Items such as corrugated cardboard, newsprint and mixed office paper are often not recycled. This is attributed in part to the large discrepancy between garbage and recycling services levels shown inTable 3; there are 5 times more garbage containers, 20 times more garbage pick-ups each week, and 45 times more annual garbage capacity (annual yardage) at all Metro campuses. This is noteworthy because while a large portion of the Metro waste stream consists of readily recyclable paper materials, the lack of conveniently located container recycling capacity makes recycling more difficult for campus custodians than garbage disposal.

Baseline Contracts, Compensation, and Incentives

Like many small commercial and institutional organizations, Metro employs a simple bid process for garbage contracting. Locations and estimated service requirements are provided to prospective contractors who submit monthly and annual price bids on that basis. In the current process, contractors submit "bundled" bids that reflect the cost of container rental, garbage pick-up, and disposal. Metro then selects the lowest bidder for a one-year service contract (with 2nd and 3rd year renewal options). Estimated annual costs for contract garbage services were approximately $27,500 in 1999.

Recycling pick-up and processing services are provided under a separate, non-contractual agreement between Metro and a local recycling processor. Under this arrangement, Metro pays a fixed service charge per pick-up and receives $21 in revenue for each ton of mixed paper collected. In 1999, Metro paid a total of about $1,700 for recycling collection and processing services and received approximately $650 in material revenues, for a net recycling service cost of $1,050.

Under current arrangements, the garbage contractor has a profit incentive to maintain or increase garbage service levels, regardless of whether or not recycling can be accomplished cost-effectively. Thus, strategies that could substantially improve Metro's recycling efforts, while decreasing garbage service requirements and associated costs are not pursued.

On the other hand, as is the case in most waste/recycling arrangements, Metro has an incentive to decrease the cost of its disposal fees. Because Metro is currently receiving revenue from recycling mixed paper, it also has an incentive to increase the portion of its waste stream diverted to recycling arrangements.

Opportunities for Cost Savings and Enhanced Recycling Service

The lack of alignment between garbage and recycling service agreements referred to above imposes unnecessary administrative and service costs on Metro, while also constraining the garbage contractor's ability to provide or profit from cost-effective waste reduction strategies. One strategy that could be implemented to increase avoided disposal costs and increase recycling revenues entails modestly increasing Metro's current recycling container capacity and service levels to handle the large volume of recyclable paper materials that Metro currently disposes. Because bulk collection of recyclable paper relies on virtually the same technology and operations as garbage pick-up (i.e., large containers and compacting vehicles), paper recycling could probably be provided at or below the cost of garbage collection service costs.[4]

This could be accomplished with minimal changes to the existing operation by simply replacing one garbage container with a recycling container in the four Metro locations that currently rely on 2 bulk garbage containers (see Table 3). This would result in:

- A more than 14-fold increase in estimated recycling tonnage (from 31 tons currently to 442 tons), which would give Metro the capability to recycle approximately 30% of its 1999 garbage stream[5]
- Potential cost reduction resulting from eliminating separate recycling service agreements at the two campuses affected by the new program;
- The capacity to produce enough recycling revenue and avoided disposal costs to reduce overall garbage and recycling service costs by about one-third of 1999 costs ($19,500)[6], plus avoided disposal costs;
- More convenient recycling for campus custodial staff resulting from more central recycling container placement.

[4] Garbage service costs include disposal costs which would be avoided altogether in a paper recycling operation.
[5] Provided the same frequency of service as existing garbage services, and assuming similar tonnage of recyclable paper materials.
[6] Assuming current revenue rates of $21/ton and $23/ton avoided disposal fees on 442 tons recycled.

4. CONAGRA FOODS

ConAgra is the largest food service manufacturer and the second largest retail food supplier in North America with annual revenues of over $27 billion and over 80,000 employees worldwide. Headquartered in Omaha, Nebraska, ConAgra is a diversified international company with over 70 brands, including Hunts, Butterball, Healthy Choice, Orville Redenbacher, Chef-Boyardee, and Parkay. This project focused on RM enhancements at the 5 buildings comprising ConAgra's Headquarter Campus: Corporate headquarters, Frozen Foods, Product Development Lab, Grain Building, and Global Trading Center. The ConAgra campus has several waste, recycling and janitorial contracts that are administered by Opus Northwest Management, a property management company.

A single waste disposal contractor provides container service, compactor, and several weekly pick-ups to all five buildings, with service levels varying from building to building. The Frozen Foods, Grain, and Global Training Center buildings are estimated to account for 82% (1,872 tons) of all Campus waste generation (2,287 tons). Thus, there is a wide variance in the estimated annual tonnage of waste generated by each building; for example, the Frozen Foods building is estimated to generate over 5 times more waste annually than the Product Development Lab. A summary of 1999 waste hauling and disposal service levels and estimated solid waste generation at the Campus is provided in Table 4.

Table 4: Waste Hauling/Disposal Service Levels and Estimated Solid Waste Generation, 1999

Location	Number of Containers	Container Size (cubic yards)	Compactor	Pickups/week	Annual tonnage (estimated) (1)
Corporate Headquarters	4	2	No	5	260
Frozen Foods	1	6	Yes	5	780
Product Development Lab	1	30	Yes	On call	155 (2)
Grain Building	1	8	Yes	3	624
Global Training Center	1	6	Yes	3	468
Total	**-**	**-**	**-**	**-**	**2,287**

Notes:

(1) Annual tonnage in the buildings are estimates based on the contracted pick-up schedule, assuming full containers and a density of 250 lbs./cubic yard for loose waste and 1,000 lbs./cubic yard for compacted waste.

(2) For the Product Development Lab, the figure indicated is actual invoiced tonnage.

Existing recycling programs have been implemented in an *ad hoc* fashion. Currently, there are 4 external organizations involved with recycling (janitorial staff, security paper processor, a waste hauling and disposal contractor, and a local materials processor) with no one party having full control or responsibility over recycling, and very little coordination among the organizations.

An estimated that 6% of the Campus waste stream (137 tons) is diverted through three separate paper recycling programs. In the first of these programs, employees in the Frozen Foods and Grain buildings recycle mixed office paper in desk-side blue bins, and are responsible for emptying their containers into central roll-off bins. ConAgra's custodial contractor collects bins from employees work stations and transports them to a large centrally located dumpster that is hauled to a material processor on an as needed basis by the garbage contractor. This program diverts an estimated 110 tons annually. In the second program, three buildings receive confidential paper shredding and recycling service through a separate contractor. For this program, the contractor provides containers for collection of paper, hauling, processing (shredding) prior to recycling. This program captures about 28 tons of office paper annually.[7] Finally, an informal employee initiated effort to recycle corrugated cardboard has been implemented in the Product Development Lab building. Corrugated cardboard is collected and stored in a room from which it is collected on a monthly basis by an unknown source. No estimates of tonnage diverted by the corrugated program were available.

Baseline Contracts, Compensation, and Incentives

In 1999, there were five separate service contracts (one for each building) with a single waste contractor for garbage hauling and disposal, as summarized in Table 5. Although the same contractor provided service to each building, unit service charges varied from $78.85 per ton for the Product Development Building to $9.21 per ton for the Grain Building. Invoiced expenses also varied; some building paid a service charge in which all costs (including container rental, hauling and disposal) are bundled into one fee; others have a service charge but a separate compactor rental charge; and one agreement breaks out compactor rental, hauling and disposal. ConAgra paid a total of $44,858 for its waste service, or an average of $19.60 per ton.

The lack of consistency and transparency in the campuses' garbage fee structure and service charges make it difficult for ConAgra to realize any savings from any type of waste minimization activity, since there are no instituted contractual means to profit from resource efficiency innovations.

[7] This figure is an estimate based on two months of data collection on recycling volumes.

Table 5: Estimated Waste Hauling/Disposal Costs at ConAgra Campus, 1999

Location	Number of Containers	Contract Structure	Annual Costs (3)
Corporate Headquarters	4	• $568/month service charge • Surcharge for "extra loose yards" • Fuel surcharge	$7,253
Frozen Foods	1	• $596/month compactor • $236.5/month container rental • Fuel surcharge & taxes	$10,221
Product Development Lab	1	• $200/month compactor rental • $125 hauling fee per load • $22.83/ton disposal fee • Fuel surcharge and tax	$12,222
Grain Building	1	• $472/month • Fuel surcharge but no tax	$5,746
Global Training Center	1	• $504/month service charge • $266/month compactor rental	$9,416
Total	**-**	**-**	**$44,858**

Notes:
Annual costs from invoices for 6/99 to 6/2000. There has been an approximate 25% reduction in cost due to discussions with the contractor in August 2000.

There are no formal recycling contracts or agreements. For mixed office paper recycling in the Frozen Foods and Grain buildings, a fee of $700 per month ($8,400 per year) is paid to the janitorial contractor to transport paper from the central bins on each floor to the dumpster. The garbage contractor hauls paper to a local material processor, but ConAgra neither pays a fee, nor receives revenue for this service. ConAgra pays a $0.07 per pound ($140 per ton) fee for the confidential paper shredding and recycling service in three buildings, which amounts to $3,920 per year for shredding and recycling services for the estimated 28 tons processed under this service. As with mixed office paper recycling, ConAgra does not receive any revenue from this program. There are no known formal arrangements for corrugated cardboard recycling, and ConAgra neither pays a fee nor receives revenue for this program.

Currently, ConAgra pays a total of $12,320 for the mixed office paper recycling program and the confidential shredding and recycling service. In addition, assuming that 6% of the waste stream (137 tons) is currently being diverted through paper recycling, ConAgra avoids $3,151 in disposal fees based on the 1999 Product Development Facility disposal fee of approximately $23 per ton. On this basis, the current recycling programs incur a net cost $9,169 per year to ConAgra.

Current arrangements provide the garbage contractors with a profit incentive to maintain or increase garbage service levels, regardless of whether or not recycling can be accomplished cost-effectively. Segregation of garbage and recycling contracts, and "bundled" waste contract structures provide no stimulus to either side to either realize or act on alternative approaches. Because the contractors and ConAgra are working at cross-purposes and are acting on disparate incentives, strategies that could substantially improve ConAgra's recycling efforts while decreasing garbage service requirements and associated costs are not pursued.

Opportunities for Cost Savings and Enhanced Recycling Service

There is significant opportunity to better coordinate and improve performance and cost-effectiveness of Campus paper recycling programs. Currently, recycling programs represents a net cost to ConAgra because recycling labor and processing fees are not offset with recycled commodity revenues or avoided disposal savings. Furthermore, ConAgra does not benefit from maximizing avoided disposal costs because all but one of the contracts does not separate out landfill disposal fees. Three possible scenarios representing expanded and restructured recycling programs include:

1. ***Expand both existing mixed office paper and confidential paper shredding and recycling service to all 5 campus buildings, and implementing more formal corrugated recycling service (17% waste stream recycled).*** This scenario assumes that at least 12% (274 tons) of the estimated annual disposal stream could be captured by a combination of mixed paper and shredding recycling programs, and 5% (114 tons) of the estimated disposal stream could be captured through more aggressive corrugated recycling.[8] These are extremely modest recycling targets, considering that paper comprises about 70% of office waste streams[9] similar to ConAgra's, and current Campus recycling efforts are not maximized. For example, the confidential paper and shredding program instituted at 3 buildings captures an estimated 28 tons/year, or about 1% of ConAgra's waste stream.

2. ***Combine/consolidate shredding and mixed paper recycling services in conjunction with a more formal corrugated recycling service (17% waste stream recycled).*** While this scenario is assumed to produce the same recycling performance impact as Scenario 1, cost savings could be realized by combining the shredding and mixed paper recycling programs.

3. ***Combine/consolidate shredding and mixed paper recycling services with higher diversion rates in conjunction with an aggressive corrugated recycling program (25% waste stream recycled).*** This scenario assumes that 18% (412 tons) of the waste stream could be captured through the consolidated paper recycling program. Furthermore, it assumes ConAgra could achieve corrugated recycling levels on par with national

[8] See Appendix 1 for disposal stream capture rates and recycling tonnages established for each scenario.

[9] High grade white paper accounts for roughly 30%, lower grade mixed paper an additional 20% and old corrugated cardboard and old newspaper accounting for 10% each. Source: Powelson and Powelson, The Recyclers Manual for Business, Government and the Environmental Community, 1992 (p. 315).

averages, which results in an overall corrugated recycling rate of 7% of current generation (approximately 160 tons annually).

In Scenario 1, the mixed office paper recycling program and the confidential shredding and recycling service expansion to all 5 buildings would amount to a cost of $27,510, assuming the same labor and processing charges per building as under the baseline. However, if revenue were to accrue at the rate of $50 per ton[10], the 274 tons (12% of waste stream) of paper would bring in $13,700. Therefore, both paper recycling programs would represent a net cost of $13,710. In addition, an expanded corrugated cardboard program that captures 114 tons (5% of waste stream) would cost $2,287, assuming $20 per ton for labor, fees, and transport to a local processor. Once again, this material may under certain conditions[11] represent approximately $4,000 in revenue to ConAgra. This program would therefore represent a net gain of $1,715. This scenario also results in higher avoided disposal fees ($8,942) given the higher total rate of diversion of 17% (389 tons). In this scenario, all recycling programs incur a net cost of $3,153 to ConAgra.

In Scenario 2, the confidential shredding and recycling service is merged with the mixed office paper recycling program, resulting in cost savings of $6,510 by elimination of the former program. This consolidated paper recycling program for the 5 buildings would therefore cost $21,000. Assuming the same diversion rates as Scenario 1, revenue generation would remain the same as Scenario 1 for both the consolidated paper ($11,700) and corrugated cardboard ($4,002) programs. The labor and fees for the corrugated cardboard program would also remain unchanged. This scenario therefore differs from Scenario 1 only in the consolidation of the confidential paper shredding program into the mixed office paper recycling program. However, the savings from the consolidation mean that the recycling programs incur net savings of $3,357.

Finally, Scenario 3 represents the most aggressive paper and corrugated cardboard recycling scenario. It assumes that the fixed labor and fees for the consolidated mixed paper recycling remain the same ($21,000 for all 5 buildings based on $700/month for 2 buildings in baseline). However, the higher diversion rates represent higher recovered material revenues ($20,583), and consequently, the costs of the program are now nearly offset by captured material revenues alone. Add to this the expanded corrugated cardboard program (with labor and fees of $3,200 and revenues of $5,600 for a net gain of $2,400), and avoided disposal fees of $13,150 on a total of 572 tons of diverted material, and the recycling program incurs net savings of $15,134.

The scenarios exhibit the opportunity to realize a net financial gain by restructuring current waste and recycling services such that revenues from recycled materials and avoid disposal fees are realized. Capturing recycled commodity values and avoided disposal costs that increase as diversion increases can offset recycling and labor and processing fees and in fact represent a savings to ConAgra over current contracts (Table 6 and Figure 5).

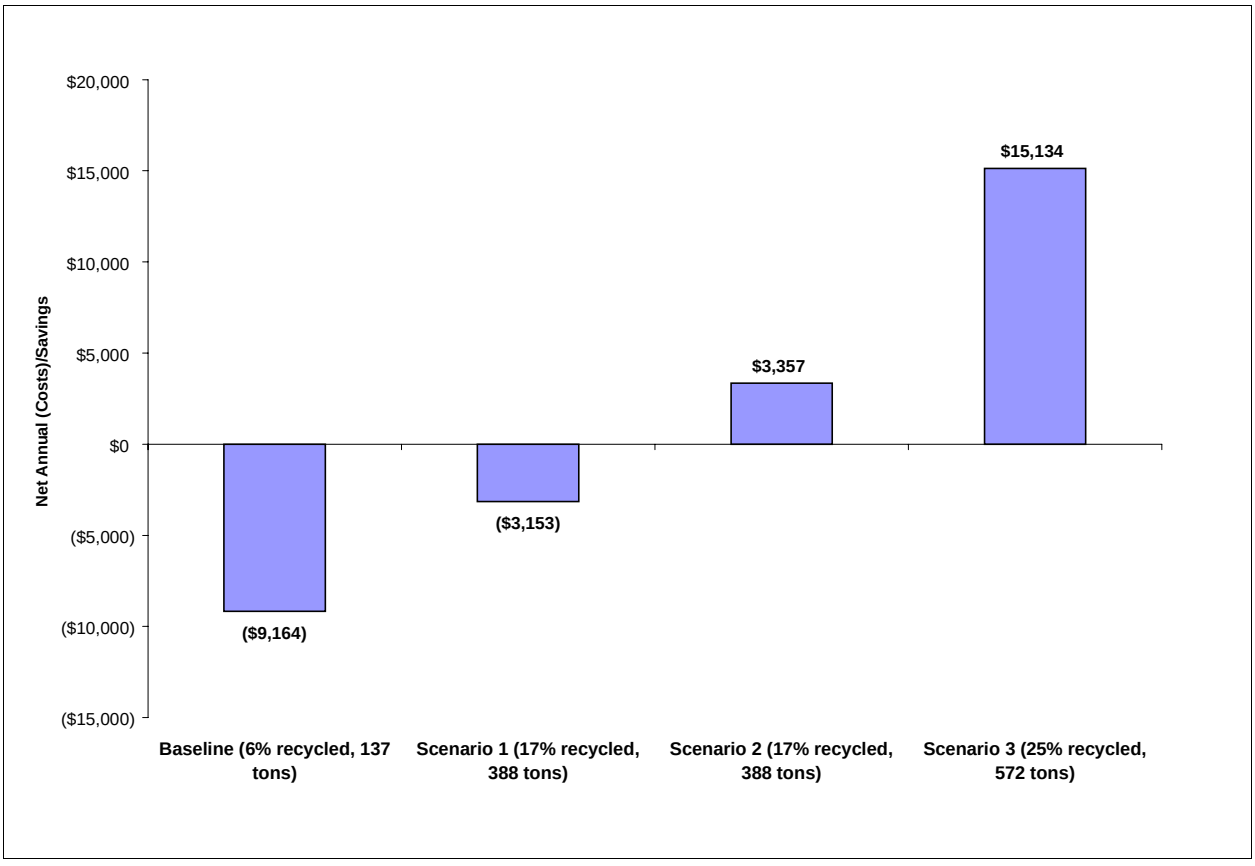
[10] Estimated based on phone quotes from Omaha Paper Stock (6/99)

[11] Under an RM contract that pays $35/ton corrugated cardboard recycled based on Chicago markets (6/99).

Table 6: Summary of Estimated Annual Financial Impacts of Paper Recycling Enhancements at ConAgra Campus

Scenario	Tonnage Paper Recycled- (% waste stream)	Tonnage Corrugated Cardboard Recycled (% waste stream)	Total Recycled	Total Recycling Revenues	Total Recycling Costs	Avoided Disposal Fees	Total Savings (Revenues-Costs) ($)
Baseline	137 (6%)	N/A	137	$0	($12,320)	$3,156	($9,164)
Scenario 1	274 (12%)	114.35 (5%)	388	$17,702	($29,797)	$8,942	($3,153)
Scenario 2	274 (12%)	114.35 (5%)	388	$17,702	($23,287)	$8,942	$3,357
Scenario 3	412 (18%)	160.09 (7%)	571	$26,186	($24,202)	$13,150	$15,134

Figure 5: Estimated Total Savings from Enhanced Recycling at ConAgra Campus, 1999



5. OMAHA PUBLIC POWER DISTRICT

The Omaha Public Power District (OPPD) is a publicly owned electric utility that provides electricity generation, transmission and distribution services to 287,320 customers over a 5,000 square mile region of Eastern Nebraska. OPPD employs 2,300 full time staff who work in maintenance facilities, customer and administrative support offices, three base-load power plants (2 coal-fired and 1 nuclear-powered) and peak load facilities throughout its service area. In 1999, OPPD had a total generating capacity of 2,100,000 kW, kilowatt-hour sales of nearly 11,500 million, and revenues of over $500 million.

OPPD's waste stream includes a much broader range of materials than what is typically referred to as "municipal solid waste (MSW)," or simply "garbage."[12] Materials such as mercury containing lamps, transformers, fly and bottom ash, utility poles, scrap cable and metals, wooden cable wheels, oil, and office equipment make up a substantial portion of OPPD's waste stream.[13] For these items, OPPD has a sophisticated and well-defined Investment Recovery System that is administered by OPPD's Material Management Division.[14] The investment recovery system fosters internal reuse, supplier take-back, recycling and, in general, avoided disposal of products and materials by providing a well-defined system for tracking material/product volumes, costs, cost avoidance (resulting from recovery), scrap value, and other related information. This system is applied primarily to surplus or obsolete products that OPPD purchases, produces, or uses within its operations. Thus, items such as corrugated cardboard and pallets, which comprise a substantial portion of OPPD's waste stream, but are not necessarily used in or produced as a direct result of OPPD's energy generation and transmission functions, are not the focus of the Investment Recovery System.

In total, OPPD has 23 separate facilities in 13 counties throughout Eastern Nebraska and the metropolitan area requiring garbage removal and disposal services that are currently provided by 8 contractors. These facilities currently have about 6,000 tons of annual disposal capacity based on container and service information provided by the Material Management Division and shown in Table 7. All service and payment information by contractor was provided by OPPD's Investment Recovery Department. Under the "1999 Service Levels" heading, the product of the total number and capacity of rubbish containers provided by each of the eight contractors, and the number of times that individual containers are picked up each month, multiplied by 12 months, yields the volume estimate shown in the "annual container yardage capacity" column. Annual tonnage was then estimated assuming full containers and a density of 250 pounds per cubic yard. Annual payments were derived from invoice values.

[12] MSW generally excludes toxic, hazardous, radioactive, industrial, and construction and demolition waste.

[13] Materials that have negotiated recovery contracts are mercury containing lamps transformers, fly and bottom ash, utility poles, scrap cable and metals, wooden cable wheels, oil

[14] This division provides purchasing and inventory services to OPPD facilities.

Table 7: OPPD Garbage Service Description, 1999

CONTRACTORS	1999 SERVICE LEVELS			1999 QUANTITIES AND COSTS		
	Number of containers	Container capacity (yards)	Pick-ups/month	Annual container yardage capacity	Est. Annual tons (1)	Annual payment
Contractor 1	2	3	20	1,440	180	
	1	30	2	720	90	
	2	0	20	226	28	
	5	2	12	1,080	135	
	5	3	12	2,160	270	
	2	30	12	8,640	1,080	
Subtotal 1				14,266	1,783	**$47,475**
Contractor 2	13	3	20	9,360	1,170	
	1	20	2	480	60	
	1	40	2	960	120	
	1	20	2	480	60	
	1	20	1	240	30	
	1	9	4	432	54	
Subtotal 2				11,952	1,494	**$53,312**
Contractor 3	1	20	3	720	90	
	2	20	10	4,800	600	
	2	20	6	2,880	360	
Subtotal 3				8,400	1,050	**$666**
Contractor 4	1	2	4	96	12	
	1	6	20	1,440	180	
	1	4	2	96	12	
	1	4	1	48	6	
	1	8	1	96	12	
	2	4	20	1,920	240	
	1	4	4	192	24	
	2	4	20	1,920	240	
Subtotal 4				5,808	726	**$21,375**
Contractor 5	2	20	8	3,840	480	
	2	20	4	1,920	240	
Subtotal 5				5,760	720	**$28,401**
Contractor 6	2	3	12	864	108	**$665**
Contractor 7	1	2	8	192	24	
	1	20	2	480	60	
Subtotal 7				672	84	**$2,349**
Contractor 8	1	3	12	432	54	**$480**
TOTAL (All Contractors)				**48,154**	**6,019**	**$154,722**

Notes:

(1) Estimated assuming full containers and density of 250 pounds per cubic yard.

All 23 OPPD facilities receive mixed paper recycling services through a program administered by the Facilities Management Division. This program recovered a total of 184 tons of mixed paper in 1999 and involves the following:

- OPPD Facility Management staff plan, oversee, and coordinate the operation, and provide container transportation services to a limited number of facilities in the metropolitan Omaha region;
- In larger OPPD facilities, contracted janitorial staff collect mixed paper from employee work stations and offices and move it to a central location for pick-up;
- OPPD employees participate in the program by segregating and placing paper in designated containers
- An OPPD material delivery contractor that is responsible for transporting a broad range of materials and products to facilities throughout the district, delivers empty paper containers to outlying facilities, and transports full containers to one of four centrally located OPPD facilities.
- An external collection agent picks up the mixed paper from the four centrally located facilities and processes and markets the material.

OPPD's Facility Management Division has also implemented a corrugated cardboard recycling program at four of its facilities in the metropolitan Omaha area (Elkhorn, North Omaha, Energy Plaza, and Omaha Center). Corrugated baling equipment was purchased for each of the four participating facilities. Baled corrugated is picked up by Facilities Management Division staff and transported to the Omaha Center where a local recycling processor picks up the bales on an as needed basis. This program recycled 44 tons of corrugated in 1999.

The Facility Management Division has implemented several other recycling and reuse programs that are either significantly smaller than those described above (in terms of volumes recovered), or are experimental or intermittent, including programs targeting: recycling of aluminum cans and reconstruction of executive office chairs.

In 1999, OPPD recycled a total of 229 tons of paper, cardboard, and other materials as a result of the programs described above, which represents almost 4% of district-wide garbage service capacity of 6,000 tons. Note that this figure masks recycling achievements at individual OPPD facilities such as the Energy Plaza, which employs one-third of OPPD's staff and represents one of OPPD's most successful programs. The Energy Plaza has reduced its waste stream by 50% and has realized a corresponding 50% reduction in garbage pick-up and disposal services since 1995.

Baseline Contracts, Compensation, and Incentives

OPPD uses a standard bid process for garbage contracting. Request for qualifications (RFQs) are issued annually (with four-year renewal options). The RFQ specifies the number and size of containers required, and pick-up frequency for each OPPD location requiring garbage removal service. Bidders submit monthly and yearly bids by facility and OPPD awards contracts on a location-by-location basis to the lowest bidder or bidders. Moreover, as is the case with most solid waste price bids of this type, contractor bids (and invoices) are "bundled," meaning that they reflect the combined cost of container rental, pick-up, and disposal of facility trash.

In 1999, 8 contractors provided garbage pick-up and disposal services to OPPD's 23 facilities at a total annual cost of nearly $155,000 (see Table 7). As mentioned in the section above, contractors are paid based on the quantity of garbage that needs to be hauled and disposed. Therefore, it is clear that their current incentives are to maintain or increase the amount of garbage for which OPPD requires disposal. This perspective is quite different than that of the OPPD, which has already established a goal of increasing diversion rates and has taken steps toward attaining a lower overall waste stream.

OPPD's recycling activities are covered under separate contractual and non-contractual arrangements. As noted above, contracted janitorial and transportation service staff play roles in the mixed paper recycling program. Because these roles are part of two separate fixed cost contractual agreements that cover a broad range of janitorial and material transportation services, The cost for its contractors' involvement in these activities is unknown. Pick-up and processing of mixed paper is handled through a separate verbal agreement between OPPD and a local non-profit organization, which provides jobs and career training for the developmentally disabled. OPPD does not receive revenue from, or pay for mixed paper pick-up and processing services.

Corrugated recycling is handled with internal OPPD resources, including 4 balers (with a value of about $8,400/baler), and OPPD labor and equipment used to transport baled corrugated from 3 of the participating facilities to the 4th participating facility where the material is picked up by a local processor. Information on the cost of internal OPPD labor and equipment dedicated to the corrugated recycling program was not available. OPPD received a total of $2,050 in revenue for its 44 tons of baled corrugated it recycled in 1999, or $46.50 per ton recycled.

Opportunities for Cost Savings and Enhanced Recycling Service

The Energy Plaza recycling program is already accomplishing an objective of RM contracting: enhanced recycling accompanied by reduced disposal service and associated costs. As noted, this program has reduced overall disposal rates and corresponding pick-up and disposal services by 50%. Dedicated mixed paper and corrugated recovery service has supplanted disposal service, and innovative reuse programs have resulted in substantial avoided purchases and disposal savings; for example, a program to rebuild executive chairs saved nearly $20,000 in avoided purchases and disposal costs.

The Plaza's success with recycling and recovery is due in large part to OPPD Facility Management staff who are acting as a Resource Manager by overseeing recycling and garbage service, assessing garbage and recycling service needs on a continual basis, identifying options for enhancing recovery, and evaluating recycling benefits in terms of disposal cost avoidance and commodity revenue. Thus, the Plaza example suggests that an RM at all or many of OPPD's facilities could produce substantial gains in district wide recovery rates. Such services could be contracted to an external RM service provider in place of or as an enhancement to existing facility waste hauling/disposal contracts.

OPPD intends to further develop its baseline contract and solid waste management information to facilitate a RM pilot project taking all plants in the metropolitan Omaha area to contract in a single bundled RM service contract in the Fall of 2001. This project would be administered by OPPD's Facilities Management Operation.

6. RM CONTRACTING PRACTICES AND POTENTIAL IN CASE STUDY ORGANIZATIONS

Based on techniques used and lessons learned from the case study organizations, standard RM practices were identified that other Nebraska organizations can use to execute RM contracts. These stem from findings regarding: (a) the availability and use of case study organizations' information on current contract pricing structure, payments, and baseline waste management/recycling levels; (b) pre-bid information-gathering tactics, and (c) the nature of the incentives created by current contract pricing structures. These practices, summarized in Table 8, are essential elements of any RM contracting process because they align customer-supplier incentives for resource efficiency by establishing a compensation mechanism based on supplier performance and continuous improvement. Furthermore, the practices provide an information-rich environment in which to evaluate resource efficiency opportunities.

Table 8: Summary of Standard RM Practices

RM PRACTICE	DESCRIPTION
1. Establish Baseline Cost, Performance and Service Levels	♦ Define scope and service levels ♦ Identify existing contract and compensation methods ♦ Establish cost and performance benchmarks ♦ Establish goals
2. Seek Strategic Input from Contractors	♦ Convene pre-bid meetings with contractors to articulate goals and address questions ♦ Allow or require bidders to submit operations plans for achieving specified improvements in existing operations
3. Align Garbage, Reduction and Recycling Services	♦ Coordinate, integrate, and formalize all contracts and services included in the baseline scope identified in Practice 1 ♦ Ensure that contractor has access to "internal" stakeholders that influence waste management and generation
4. Establish Transparent Pricing for Services	♦ Delineate pricing information to specific services such as container maintenance, container rental, hauling, disposal, etc. ♦ Allow variable price savings, such as "avoided hauling and disposal" to flow back to generator and/or be used as means for financing performance bonuses
5. Cap Compensation for Garbage Service	♦ Establish a cap on waste hauling/disposal service compensation that decreases gradually over time ♦ De-couple contractor profitability from waste generation and/or service levels ♦ Based initially on reasonable estimates of current hauling and disposal service and costs as per Practice 1
6. Provide Direct Financial Incentives for Resource Efficiency	♦ Establish compensation that allows contractor to realize financial benefits for service improvements and innovations. ♦ Assess liquidated damages for failing to achieve minimum performance benchmarks or standards

Several of the above practices can be applied immediately in case study organizations, as discussed below.

1. *Establish Baseline Cost, Performance, and Service Levels.* For all organizations except OPPD, baseline information on cost, performance, and service levels was developed in the course of this project. In OPPD's case baseline information was obscured by the number of players involved in OPPD's garbage and recycling operations, which includes staff from at least 2 OPPD divisions (Facilities Management and Materials Management), 8 garbage contractors, 2 recycling organizations, 23 OPPD facilities, and various contracted janitorial staff. Some of this information is coordinated and presented in Table 7, however, more detailed information, such as facility-based recycling and garbage service levels and costs will be needed to evaluate and execute the remaining RM bid and contracting practices. As noted previously, OPPD intends to develop such information within the next few months for facilities in the Omaha metropolitan area.

2. *Seek strategic input from prospective contractors.* Each of the case study organizations would benefit from improved collaboration with prospective contractors in bid phases and throughout the term of their contracts. Contract bid requests have not historically stated an explicit preference for recovery over solid waste disposal, and often bidders have no opportunity to provide input on service requirements. By emphasizing that maximizing cost-effective diversion is a priority, prospective suppliers receive clear information on customer priorities and can respond accordingly in the garbage and recycling collection bid request documents. Providing this information and soliciting input in the pre-bid period allows the generator to explore the extent to which prospective contractors can propose alternative solutions and pricing structures in an "open"[15] bid structure that would identify and provide cost-effective improvements to existing services. While this approach is likely to produce a wider array of service options from which to choose, it may require a heavier initial investment in generator staff time to interact with prospective bidders and evaluate contractor proposals.

   For example, Metro could issue a request for bids that leave it up to respondents to specify recycling service levels and associated costs. Bids could address both disposal and recycling service, however, Metro should specify in bid requests that maximizing cost-effective diversion is a priority. Metro should also require bidders to submit operating plans for both recyclable and garbage removal services in order to ensure that planned services conform with Metro rules, regulations and constraints. A major advantage of this approach is that it is flexible and allows Metro to explore the extent to which vendors are willing and able to identify and provide cost-effective improvements to existing services.

3. *Align garbage, reduction and recycling services.* In every organization, garbage and recycling are provided through separate formal and informal agreements. While this is advantageous in cases such as OPWD's where there is a third party administrator (OPWD) contracting on behalf of two parties (residents and service providers), in all other cases it

[15] An open specification includes performance-based objectives in place of limiting requirements to location, service level, number of containers and pick-ups exclusively, leaving it open to bidders how they propose to satisfy performance objectives.

produces conflicting incentives for garbage contractors and internal or contracted recycling efforts. In these circumstances, garbage contractors receive a profit incentive to maintain or increase garbage service levels, regardless of whether or not recycling can be accomplished cost-effectively.

RM seeks to coordinate services so that waste management and recycling elements of an RM program are mutually reinforcing in support of resource efficiency goals. A key benefit of coordination are fee structures that allow the generator to realize across the board recycling revenues and cost savings from avoided hauling/disposal fees. Also, this ensures that all services are leveraged to work towards the same organizational resource efficiency goals, while reducing management costs associated with administering numerous uncoordinated contracts and agreements.

4. *Establish transparent pricing for services.* All organizations would benefit from having suppliers "unbundle" pricing structures to specify hauling on a fixed basis, and disposal on a variable basis (i.e., $ per ton tipped). This allows organizations to more easily assess and negotiate savings on the volume of materials disposed. Furthermore, negotiating a rate of return on recycled materials would be advantageous, as many partners do not receive revenues from all recycled materials.

   In OPWD's case, for example, garbage and recycling collection services are presently addressed through a single contract. While it makes sense to preserve the current single contract arrangement for these services, the OPWD could require bidders to submit separate bid prices for garbage and recycling collection service in order to make bids as transparent as possible and to aid in the evaluation of bid prices. A pricing structure could be established on a variable basis to allow OPWD to achieve savings on recycling collection capacity not used by households. Overall, however, OPWD's existing disposal and recycling arrangements allow it to benefit from increased levels of diversion, a contract arrangement from which other partners would benefit.

   Such advantageous arrangements could be fashioned with minor modifications to other case study organization' bid processes by simply requiring bidders to submit monthly and annual pick-up price bids based on estimated service requirements, and disposal price bids on a per ton basis. This would allow organizations to realize direct savings from increased diversion in the form of decreased disposal costs. Furthermore, agreement may be reached for revenues from recycled materials to flow back to the customer. These dual savings could be used to finance performance bonuses and/or assess reasonable liquidated damages as described below.

5. *Cap Compensation for Disposal Service.* Each organization could limit the extent to which their existing contracts provide a profit incentive for-ever increasing garbage service levels. OPWD already does this by tying garbage service compensation to the total number of residential houses eligible to receive service. Similarly, the OPPD has accomplished this at its Energy Plaza facility by instituting an on-call system for garbage hauling service which has reduced garbage service levels and costs by more than one half. ConAgra and Metro

could establish similar practices using the baseline information developed in the course of this project.

6. *Provide Direct Financial Incentives for Resource Efficiency*. In each case, partner organizations, could provide performance bonuses for exceeding a mutually agreed upon baseline recycling/resource efficiency performance level. Savings on avoided landfill disposal fees and revenues received for recycled commodities could finance such a performance bonus. To help ensure modest gains in recycling, minimum performance levels could be increased over each year of the contract period. For example, in OPWD's case increasing the minimum by 10% over the baseline recycling for a 5-year contract period would produce a 50% increase in recycling by the end of the contract period. Compensation could be structured such that the contractor receives performance bonuses as long as the minimum annual performance level is achieved. Thus, if in year 3 of the OPWD contract the minimum recycling level was 26,000 tons and the contractor collected 30,000 tons of recyclables, the contractor would receive a performance bonus on 4,000 tons of recyclables. On the other hand, if the contractor collected 22,000 tons in year 3, it would pay liquidated damages on 4,000 tons of materials. Establishing minimum tonnage requirements and associated performance bonuses may give contractors the financial incentive they need to assume a more active role in organizational recycling efforts that extends beyond hauling and material processing.

Table 9 provides a summary of key RM practices from which partner organizations would derive the most benefit.

Table 9: Baseline RM Practices in Case Study Organizations, 1999

RM Practices	Omaha Public Works Department	Metro Community College	ConAgra	Omaha Public Power District (1)
Establish Baseline Cost, Performance and Service Levels	✓	✓	✓	✓
Seek Strategic Input from Contractors				
Align Waste and Recycling Services	✓			✓
Establish Transparent Pricing for Services	✓			
Cap Compensation for Garbage Service	✓			✓
Provide direct Financial Incentives for Resource Efficiency				

Notes:

1) Results for OPPD apply to the Energy Plaza Facility.

7. RM CONTRACTOR PERSPECTIVES AND ISSUES

RM as a business model is in its very early stages. It's potential has barely been recognized, much less exploited. Consistent with general business trends of customers seeking more value through knowledge-based services instead of products, many companies already receive some elements of RM service (though they may not call it RM). For example, hauling and disposal contractors may provide assistance in identifying better markets for secondary materials, or suggest alternatives to material containers or packaging that can reduce waste. However, many of these activities have not been recognized as remunerative activities in service contracts.

RM holds the promise of transforming the waste management industry by changing how waste-related companies define the value of their services and the way they generate profit. Supplying RM services is by no means an opportunity limited to traditional waste management companies. Because RM requires a broader array of information-intensive management services, there are several other classes of companies potentially capable of filling the role, including engineering firms, management consultants, or property management groups. Initial indications suggest that RM can be highly profitable for suppliers, whatever their current make-up or designation. Likewise from a generator perspective, this project has presented evidence of potential and actual contract cost savings and improved customer service in support of resource efficiency goals.

For a waste generator, disposal costs (and thus perceived savings), tend to be small compared to other expenses. On the other hand, what are relatively small costs to a waste generator can result in substantial increases in contract value for the RM supplier. For example, Metro Community College could negotiate with its contractor to replace surplus garbage disposal capacity with recycling service. Because the institution has a high value waste stream consisting of corrugated and office paper, these changes alone would result in disposal savings and recyclable commodity value of nearly $19,500.[5] If the institution were to pass these savings along to the supplier as part of an RM profit-sharing agreement, it would increase the supplier's contract revenue by nearly two-thirds while producing a fourteen-fold increase in the institution's recycling rate. This demonstrates the substantial value of the combined cost effects of increased recycling and avoided disposal to RM contractors given the proper contractual incentives.

The above example does not, however, capture the concept of potential savings that may accrue to suppliers in an RM gain-sharing agreement by influencing material use or other internal stages that are farther upstream. If recycling a ton of office paper nets a total savings (i.e., avoided disposal cost and commodity value) of $44 per ton, as in the Metro case, preventing consumption of paper altogether through duplex copying, for example, would produce savings in the form of avoided purchase costs of well over $1,000 per ton—a portion of which could be shared with the RM contractor.

Clearly there will be a point of diminishing returns for RM service providers, but there is substantial "low hanging fruit" that will allow contractors to profit from RM in the near term. This consists of readily recyclable materials such as corrugated cardboard and paper. As RM evolves, contractors are likely to pursue both market development for recyclable materials that are more difficult to recover and additional resource efficiency opportunities from improvements to other internal processes.

RM suppliers can anticipate other benefits including the ability to distinguish themselves in a consolidating and increasingly competitive market. Public hauling and disposal companies, for example, are under pressure from Wall Street to increase cash on hand in order to re-instill investor confidence.[6] Diversifying their revenue stream with RM services is therefore an attractive area for growth as it involves little capital investment.

Finally, the type of customer-supplier relationship inherent in RM provides the opportunity to facilitate more strategic partnerships with customers in which the focus on the supplier shifts from a cost focus to a value-added service focus. This facilitates the supplier's ability to offer additional environmental services.

Notwithstanding these potential benefits, there are several hurdles that must be overcome to produce a visible and practicable RM service industry. Reducing disposal volume poses an obvious conflict for a hauling or disposal company that profits through disposal volume sales. Furthermore, the skills required to provide RM service are inherently different from those required for providing hauling and disposal service. While traditional solid waste and recycling service contractors could develop the required expertise to provide RM services, under typical contracts, they lack incentives to take this step and have an established business approach which neither their clients nor the government are pushing them to change.

There is also a lack of broad awareness of the RM concept. While many contractors provide some limited form of RM services, these are not yet formalized in contracts or institutionalized as broadly applicable services. Given this existing environment, many contractors may be unwilling to take the risk to amend their current business models. The extent to which service providers will transform themselves without a well-defined, industry supported service and gain-sharing compensation model is likely to be limited at best.

At least three categories of companies are beginning to provide RM services to a small number of generators.

1. The $57 billion a year disposal industry, including companies such as Waste Management, Environmental Quality Services, and Heritage are beginning to offer RM-like services in response to demands from large generators such as GM. Depending on how the RM demand proliferates, traditional hauling and disposal companies might be forced to weigh in on the issue and develop their own RM capacity or risk a rapidly diminishing service base.

2. Companies with specialized expertise with respect to internal waste or process management and/or resource efficiency. These include janitorial service firms, industrial cleaning companies, property management companies, and consultants.[7]

3. Waste brokers, a rapidly growing segment of the solid waste industry that provides hauling and disposal contract management services for national companies. Brokers currently rely primarily on a business model that produces value by aggregating contracts, achieving economies of scale, and reducing administrative and hauling expenses. As may be the case

for traditional service providers, brokers may see RM service as a means of diversifying their profit base.

In order to assess the status and potential of the Nebraska RM service industry, a Resource Management Supplier Forum was convened in Omaha Nebraska, on October 3rd, 2000 with the objectives of

(1) Conveying RM service and contracting concepts to existing or prospective RM contractors;

(2) Articulating case study organizations' interest in the RM service/contract model; and

(3) Soliciting general feedback from potential RM service providers on opportunities and limitations of the RM model in a diverse range of settings.

Over thirty prospective RM contractors attended the forum. Attendees included traditional waste/recycling/diversion service providers from within the region, those from outside the region that were currently providing or interested in providing RM services, and organizations interested in acting as an RM contractor and sub-contracting out primary service functions, such as engineering consultants or property managers.

The forum provided results from the case study organizations, followed by a discussion examining future opportunities and constraints for Resource Management, and next steps for expanding interest in RM both regionally and nationally. The forum's open dialogue encouraged suppliers to actively engage themselves in considering the scope and implications of the RM market.

Feedback from attendees was extremely positive – 61% of follow-up survey respondents felt that the forum was "very useful". Comments indicated that examples of successful use of RM were most useful components of the session. Others found that the open discussion and Q&A sessions dealt with practical concerns was most useful. Suggestions for improvements tended to involve requests for more specific case studies and contract examples/language, in addition to examples from smaller organizations that have successfully implemented RM concepts. Furthermore, participants requested further information on RM providers, RM for government entities and municipalities, and guidance such as a document that leads organizations through basic steps to achieve RM contracts.

Participants identified several potential constraints associated with providing RM service including challenges to smaller firms and management resistance to the concept. However, other respondents noted the broad applicability of RM to many industries, and the desire to incorporate elements of RM into future contract negotiations such that waste is viewed as an asset to be managed, not simply disposed of and forgotten.

8. CONCLUSIONS

Most waste generating organizations within Nebraska contract with the private haulers for solid waste disposal and recycling services. Although they are not directly involved in the collection, processing, or end-use of recycled materials, these organizations, through their contractual relationships, are a key to the long-term success and viability of waste reduction in Nebraska.

This research suggests that RM is widely applicable in Nebraska business, institutional, and municipal settings and that there are substantial opportunities for cost-effective waste reduction and recycling through more strategic RM contracting and bid procedures. RM contracts can be structured to benefit both waste generators and their RM service providers.

While research thus far has been fruitful, there is much work left to be accomplished in creating capacity to advance RM contracts and services. Continued development and dissemination of RM cases studies, tools, and best management practices will foster its promotion as a voluntary, market-driven mechanism that organizations can adopt to achieve continuous cost and environmental improvements.

To this end, the Nebraska State Recycling Association is pursuing the creation of a Mid-West RM Council, which will:

- Provide RM bid contracting assistance to case study and other Nebraska organizations that rely on disposal contracts;
- Serve as a clearinghouse for RM information developed through ongoing RM projects in Nebraska, Missouri, Iowa, and other Midwestern States; and
- Work to develop and expand the RM service industry in Nebraska and other Midwestern States.

In addition to these efforts this project has contributed to the development of a national initiative to advance RM contracting and services, that includes the following ongoing projects

- *Executing an RM Contract for the West Des Moines School District, sponsored by the Iowa Department of Natural Resources (Des Moines).* RM bid specifications, an RFP and contractual terms are being developed for the West Des Moines School District.
- *Demonstrating the Potential for Cost-Effective Diversion through RM Contracting in Missouri, sponsored by the Missouri Department of Natural Resources* (Jefferson City). Existing and potential RM contracting techniques will be demonstrated in industries and institutions in the St. Louis and Kansas City metropolitan areas.
- *Massachusetts RM Case Studies.* RM contracting practices and potential are being demonstrated in ten Massachusetts organizations that rely on disposal contracts.

- *From Waste to Resource Management: Reinventing Waste Services and Contracts*, sponsored by the EPA's WasteWise Voluntary Partnership Program. The United States Environmental Protection Agency is publishing an RM concept paper that will provide a foundation for research, outreach and technical assistance to more than 1,000 partners participating in its program. An initial draft of the paper will be completed soon, and several regional workshops will be convened to solicit feedback. A final report will be completed by June.

- *RM Supplier Forum*, sponsored by Tellus Institute (Boston) with funding support from EPA. A business roundtable with leading national and regional recycling and waste service providers and other businesses interested in providing RM service will be convened at the Tellus Institute this spring. The forum will seek to develop supplier capacity to provide and promote RM service.

Between 1992 and 1998, the value of recycled commodities and avoided disposal costs resulting from recycling in Nebraska was nearly $75 million. The uncaptured value of recyclable commodities that remain in Nebraska's waste stream, and the potential to significantly increase and allocate avoided disposal fees through RM practices could be a boon to both generators and and RM service providers in Nebraska. As noted previously, the state has made significant progress developing a recycling infrastructure for collection, processing, and end-use of recycled materials but recycled quantities have leveled off in recent years. By transforming relationships between waste management companies and their customers, RM will help Nebraska achieve the "next level" of waste reduction and achieve its 50% waste reduction goal by 2002.

9. REFERENCES

[1] Underwood, Warren, 2000. General Motors Corporation Worldwide Facilities Group. Adopted from a presentation at the 2000 National Recycling Congress, Charlotte, NC, entitled: "Resource Management."

[2] GM has been doing Chemical Management for over 15 years. For more information on chemical management services see www.chemicalstrategies.org.

[3] Underwood, Warren, 2000. General Motors Corporation Worldwide Facilities Group. Adopted from a presentation at the 2000 National Recycling Congress, Charlotte, NC, entitled: "Resource Management."

[4] These workshops comprised: March 27, 2001 (Hastings, NE), March 28, 2001 (Lincoln, NE), and March 29, 2001 (Omaha, NE)

[5] Assuming $21/ton revenue on recyclables and $23/ton avoided disposal fee on 442 tons materials recycled/diverted.

[6] Based on the following investor reports for the solid waste industry: 1) Pavese, Alan. Greenline: An Environmental Services Quarterly. *Cash is King.* Credit Suisse First Boston Corporation, Boston, MA. March 20, 2000. 2) Gray and Coltman. Environmental Quarterly. *Returning Interest Cleaning Up Stocks.* Deutsche Bank, Chicago, IL. August 2000.

[7] Based on a "RM Supplier Forum" convened for *Advancing Resource Management Contracting in Nebraska* , October 3, 2000.